Use of Estimating Tools with the Agency Mission Planning Model (AMPM)

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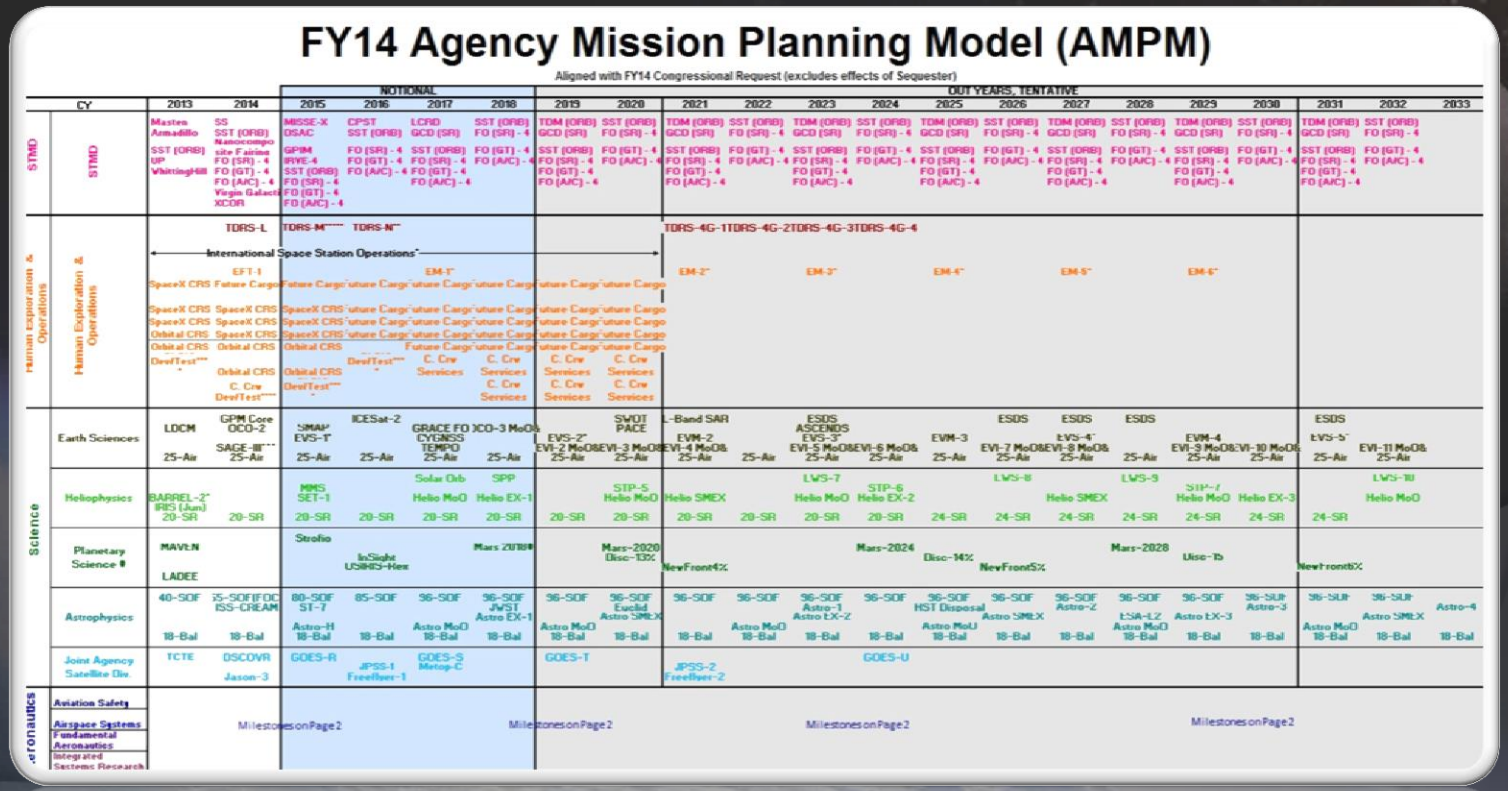
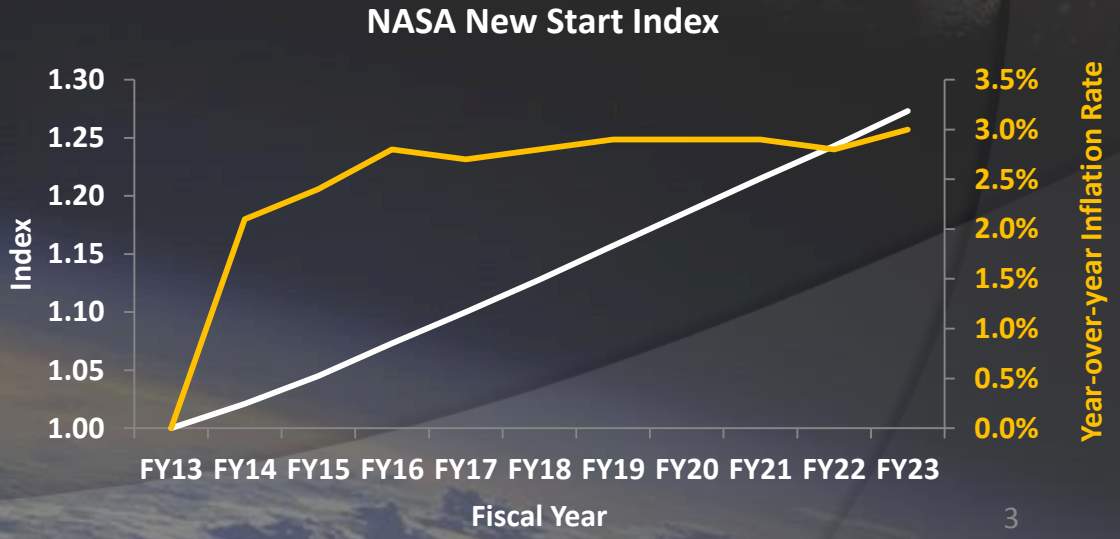
Introduction to the AMPM

- Agency Mission Planning Model (AMPM) maintains official, integrated manifest of Agency's approved and notional content
- AMPM represents both ground (e.g. STMD GCD) and flight efforts (e.g. SMD), as well as technology milestones (e.g. ARMD)
- AMPM aids agency initiatives to forecast capability, services, technology, and infrastructure needs (e.g. SCaN architecture planning)



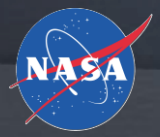
Introduction to the AMPM cont'd

- The AMPM has been reinvigorated over the past two years
- Product supports budget development and communicates activities over 20-year horizon
- The AMPM aligns with the President's Budget and out-year budget guidance from the CFO
- AMPM serves as a baseline for studies (e.g. issue paper analyses)
- For out-year projects, SID utilizes estimates for project cost/phasing
- NASA New Start Index is used to account for difference in buying power on new-starts
- AMPM consists mainly of mission cadences, however some accounts show milestones (e.g. ARMD, more coming)



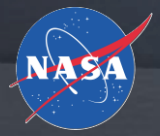
More on the utility of the AMPM

- Allows us to baseline assumptions for future efforts with the Mission Directorates
- Allows us to sanity check the Agency's plans for the future
  - Do our future missions fit within our budget assumptions?
  - Are there budget wedges in the horizon that allow for additional content? How much?
  - Are cadences too aggressive or not aggressive enough?
- Enables a long term view of our planned investments
  - What types of agency investments are growing over time?
  - Are we investing enough in the formulation of new missions?
  - Are our investments in mission development growing over time?



AMPM Analysis Approach

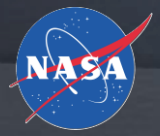
- Project cost/schedule for existing efforts typically known (within some envelope) and/or are restricted (caps)
- Future new-starts are less certain, so CS tools useful in helping determine things like budget phasing (at the portfolio level) and mission cadences at different funding levels
- Much of the research and tools developed for CS estimating are more than sufficient for higher-level enterprise modeling
- The reinvention of the AMPM process and modeling was mainly driven by non-technical factors:
  - Building consensus among our program leadership,
  - Maturing senior leadership's understanding of portfolio dynamics
- The buoyantly driven approach has helped created a common understanding of the agency portfolios and is helping create a common understanding of the drivers impacting the agency's ability to perform (e.g. buying power, effect M/B has on workforce, etc.)



CAD Tools and Other Research

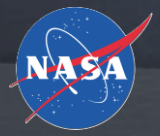
- As we've built up, we've looked to CAD community for tools and research to improve fidelity and in general tell us more
- Examples:
  - Once NASA Cost Engineering Database (ONCE)
    - historical project information
  - Schedule Management and Relationship Tool (SMART)
    - comparing project schedule to similar efforts
  - Phasing Estimation Relationship Formulation Task (PERFT)
    - estimate Phase A-D budget phasing
  - Phase E Cost Analysis for NASA Science Missions, AIAA 2012-5138
    - estimate Phase E costs for Science missions

If you have a tool or research you think we'd find useful, please let us know



Project Budget Estimation

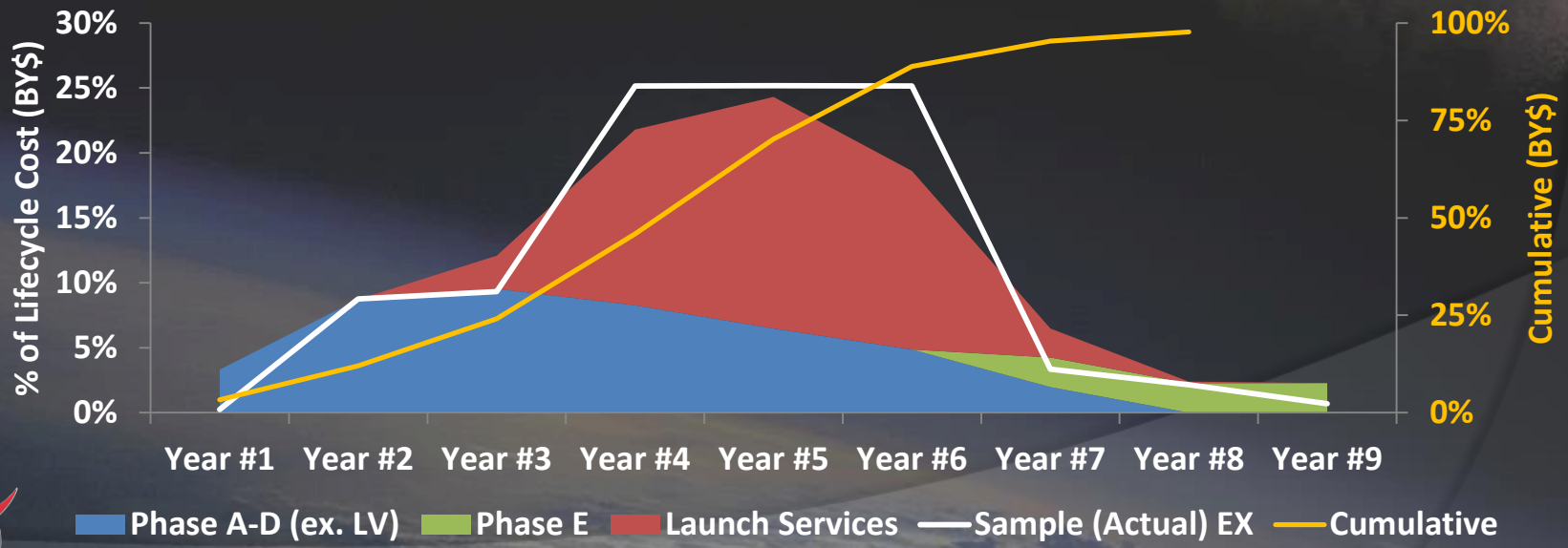
- Mission class and other characteristics derived from manifest entry
- High-level characteristics (e.g. LCC range) for mission-type determined from ONCE and other sources
- Project schedule approximated and compared with SMART
- Phase E (prime operations) approximated using AIAA 2012-5138 and compared to historical or scaled data
- Launch service cost/phasing estimated (NLS, historical allocations)
- Phase A-D cost calculate and PERFT used to approximate budget phasing
- Again, we're taking a stepping stone approach – next we'd like to incorporate ranges/distributions for our input variables and utilize ARGO (more to come on planned next steps)



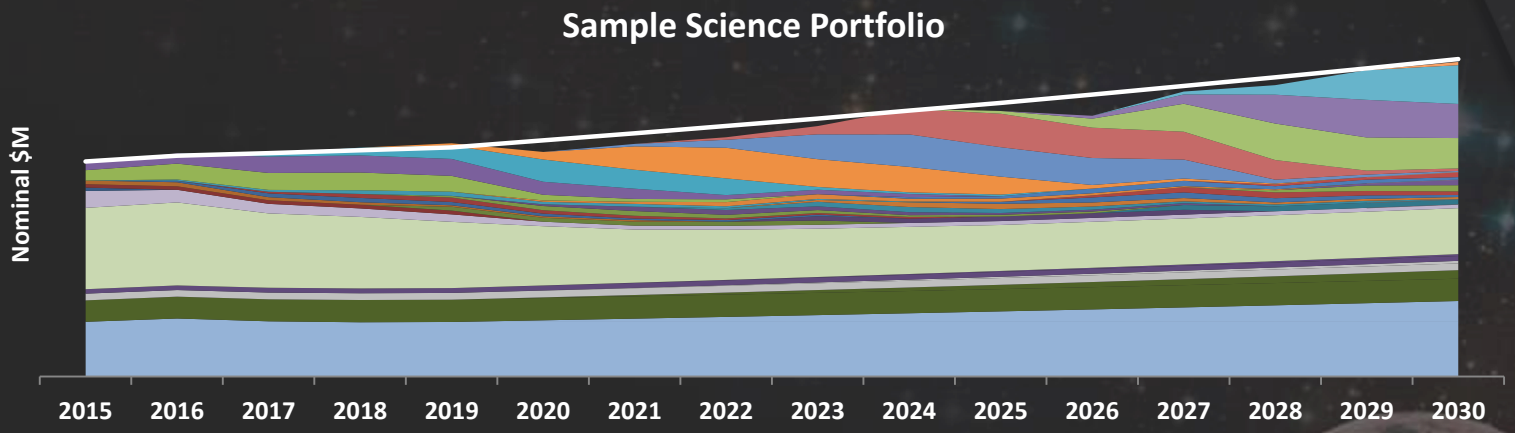
Example

- "small" science mission w/ 4 instruments
- AO with GFE instrument(s)
- Pre-Formulation: 12-months, Formulation: 12-months, Development: 48-months, Operations: 36-months
- Delta II or Falcon 9

Year #1	Year #2	Year #3	Year #4	Year #5	Year #6	Year #7	Year #8	Year #9
Pre-Formulation	Formulation	Development				Operations		



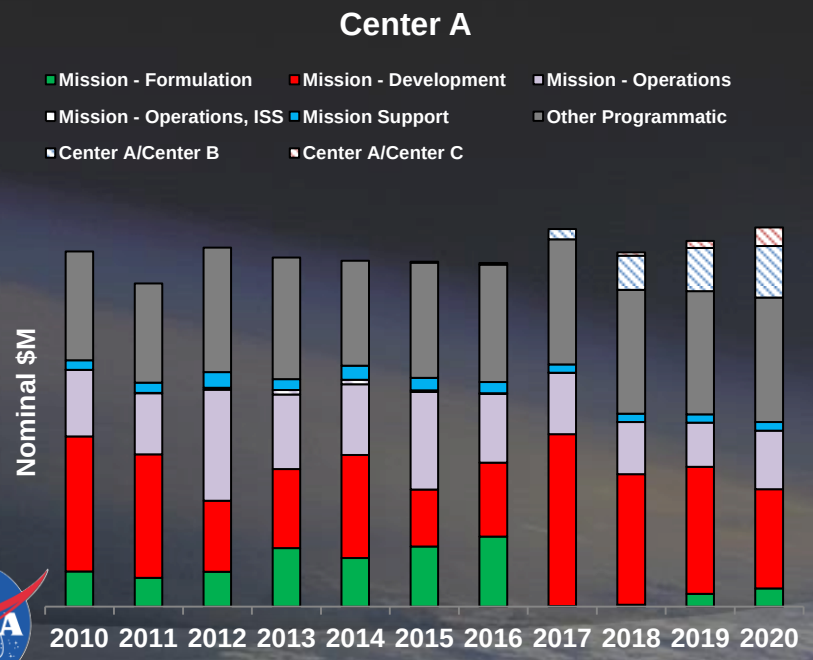
Portfolio Roll-up

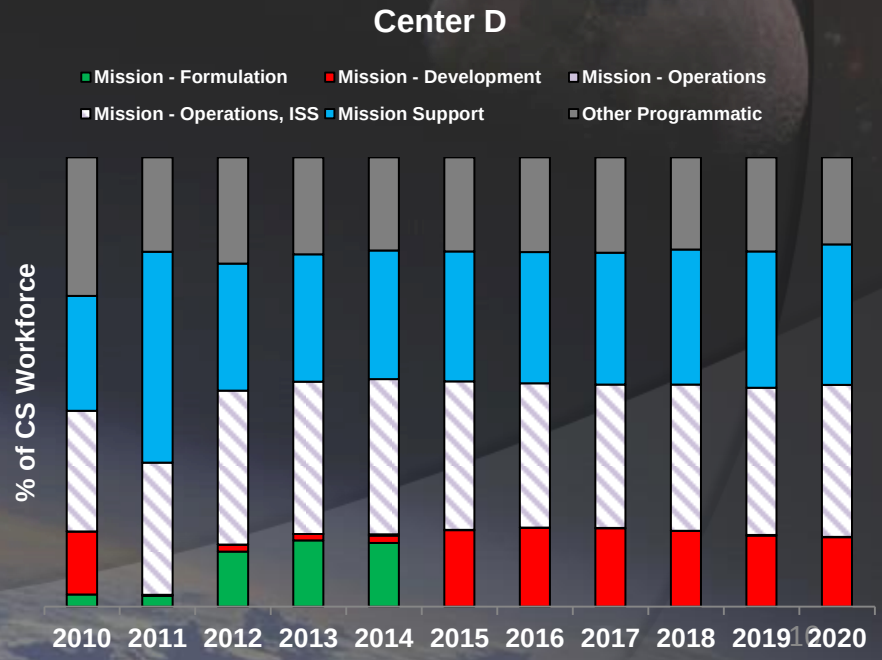


- CS research and tools have allowed us to make the AMPM analysis parametric - a tool we can essentially iterate on in front of management, explain to them what its doing, and then see the results
- Parametric modeling allows us to better communicate the complexities of a multi-portfolio enterprise like NASA and inform senior leadership as they make decisions
- An integrated model approach to the AMPM helps us really view the agency as ecosystem rather than a collection of stovepipes
- We continue to mature the analysis and form new connections to important elements in the enterprise (e.g. impact of funding scenarios on Agency R&TD spending)

Center & Workforce

- As we explore funding scenarios and budget options, we want to ensure we have the right FTE allocations but also have a flow of work that sustains critical workforce functions
- Connection between mission manifest and center FTE forecasting is a recent addition we're building on (some of this is recycling work done in the past that the agency simply hasn't been doing)
- Flow of funds to/FTE demand at centers when we look at budget trades, new starts (MB, Direct/AO), etc.



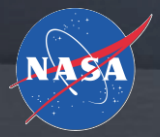


Future Additions to the AMPM Analysis

- Integration of R&TD efforts into portfolio w/ linkage to possible future manifest activities (i.e. options and decision analysis) (what effect will these activities have on success?)
- Leveraging of TCASE and other technology cost estimating research/tools (what's the OoM to get us from A to Z via some technology pipeline?)
- Workforce skill area mapping to AMPM activities (are we equipped for success?)
- Linkage of major agency/center assets and facilities to project phases (where is the real demand? where are the largest institutional risks that could imped the success of our programs?)
- Integrate risk-adjusted cost/schedule-to-go for existing efforts in portfolio (how much wedge do we really have for new "stuff"?)
- Modeling off-nominal CS performance using historical variance based on things such as mission class, lead center, etc. (when you don't assume success, how much do we have to tailor our strategies/plans?)

Having an Impact
(some lessons learned to pass on)

- To build more support with senior leadership, need to connect what you're doing with the tangibles
- Consensus is only powerful when its broad – should be communicating what you're modeling/how you're modeling it to wide range of stakeholders such that everyone understands
- The 70% solution is more than enough for enterprise level portfolio analysis – sometimes even OoM is enough
- Every degree of cross-coupling buys you twice as much impact as every degree of fidelity - segregated analyses that don't connect the dots cross-agency will struggle to resonate with enough key leadership to be impactful
- Total cost is important to a lot of stakeholders but phasing is really the mechanism leadership utilizes and thinks in terms (either consciously or subconsciously)



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Questions ?

Visit
http://www.nasa.gov/news/budget/index.html
for the latest AMPM release

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